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DATE: Thursday, July 15, 2004

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		DB=USPT,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR	
☐	L2	L1 and drug	6
☐	L1	mesoporous adj3 silicon$	47

END OF SEARCH HISTORY

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Search Results - Record(s) 1 through 6 of 6 returned.

☐ 1. Document ID: US 6734000 B2

Using default format because multiple data bases are involved.

L2: Entry 1 of 6 File: USPT May 11, 2004

US-PAT-NO: 6734000
DOCUMENT-IDENTIFIER: US 6734000 B2

TITLE: Nanoporous silicon support containing macropores for use as a bioreactor

DATE-ISSUED: May 11, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Chin; Vicki I.	La Jolla	CA		
Bhatia; Sangeeta N.	La Jolla	CA		
Sailor; Michael J.	La Jolla	CA		
Collins; Boyce E.	La Jolla	CA		

US-CL-CURRENT: 435/176; 435/283.1, 435/29, 435/395, 435/71.1, 435/71.2

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 2. Document ID: US 6696258 B1

L2: Entry 2 of 6 File: USPT Feb 24, 2004

US-PAT-NO: 6696258
DOCUMENT-IDENTIFIER: US 6696258 B1

TITLE: Mesoporous materials and methods of making the same

DATE-ISSUED: February 24, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wei; Yen	Plainsboro	NJ		
Jin; Danliang	Twinsburg	OH		
Ding; Tianzhong	Wilmington	DE		
Xu; Jigeng	Philadelphia	PA		

US-CL-CURRENT: 435/7.2; 423/702, 424/484, 424/489, 424/499, 435/14, 435/4, 435/7.1,

436/518, 436/523, 436/524, 436/528

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

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☐ 3. Document ID: US 6666214 B2

L2: Entry 3 of 6 File: USPT Dec 23, 2003

US-PAT-NO: 6666214
DOCUMENT-IDENTIFIER: US 6666214 B2

TITLE: Biomaterial

DATE-ISSUED: December 23, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Canham; Leigh T	Malvern			GB

US-CL-CURRENT: 128/899; 604/891.1, 623/11.11

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

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☐ 4. Document ID: US 6630170 B2

L2: Entry 4 of 6 File: USPT Oct 7, 2003

US-PAT-NO: 6630170
DOCUMENT-IDENTIFIER: US 6630170 B2
**** See image for Certificate of Correction ****

TITLE: Mesoporous compositions and method of preparation

DATE-ISSUED: October 7, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Balkus, Jr.; Kenneth J.	The Colony	TX		
Coutinho; Decio H.	Dallas	TX		

US-CL-CURRENT: 424/489; 424/400, 424/600, 514/772.4

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

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☐ 5. Document ID: US 6322895 B1

L2: Entry 5 of 6 File: USPT Nov 27, 2001

US-PAT-NO: 6322895
DOCUMENT-IDENTIFIER: US 6322895 B1

TITLE: Biomaterial

DATE-ISSUED: November 27, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Canham; Leigh T	Malvern			GB

US-CL-CURRENT: 428/450; 427/58, 428/446

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

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☐ 6. Document ID: US 5922299 A

L2: Entry 6 of 6 File: USPT Jul 13, 1999

US-PAT-NO: 5922299
DOCUMENT-IDENTIFIER: US 5922299 A
**** See image for Certificate of Correction ****

TITLE: Mesoporous-silica films, fibers, and powders by evaporation

DATE-ISSUED: July 13, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bruinsma; Paul J.	Kennewick	WA		
Baskaran; Suresh	Kennewick	WA		
Bontha; Jagannadha R.	Richland	WA		
Liu; Jun	West Richland	WA		

US-CL-CURRENT: 423/335; 423/336

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

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Terms	Documents
L1 and drug	6

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L2: Entry 3 of 6 File: USPT Dec 23, 2003

US-PAT-NO: 6666214
DOCUMENT-IDENTIFIER: US 6666214 B2

TITLE: Biomaterial

DATE-ISSUED: December 23, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Canham; Leigh T	Malvern			GB

US-CL-CURRENT: 128/899; 604/891.1, 623/11.11

CLAIMS:

What is claimed is:

1. A method of implantation comprising the step of implanting an electronic device within a living human or animal body, wherein the device includes bioactive silicon.

2. A method according to claim 1, wherein the bioactive silicon comprises at least partially porous silicon having a porosity greater than 4% and less than 70%.

3. A method according to claim 2, wherein the porous silicon contains macropores for enhancing vascular tissue ingrowth.

4. A method according to claim 2, wherein the porous silicon extends at least partially over an outer surface of the device.

5. A method according to claim 1, wherein the device is a sensor device.

6. A method according to claim 1, wherein the bioactive silicon is polycrystalline silicon.

7. A method of delivering a drug to a living animal or human comprising placing the drug to be delivered on or within a bioactive silicon structure, and thereafter administering the drug-laden bioactive silicon structure to a living animal or human.

Previous Doc Next Doc Go to Doc#

L2: Entry 2 of 6 File: USPT Feb 24, 2004

US-PAT-NO: 6696258
DOCUMENT-IDENTIFIER: US 6696258 B1

TITLE: Mesoporous materials and methods of making the same

DATE-ISSUED: February 24, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wei; Yen	Plainsboro	NJ		
Jin; Danliang	Twinsburg	OH		
Ding; Tianzhong	Wilmington	DE		
Xu; Jigeng	Philadelphia	PA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Drexel University	Philadelphia	PA			02

APPL-NO: 09/ 598717 [PALM]
DATE FILED: June 21, 2000

PARENT-CASE:
CROSS-REFERENCE TO RELATED APPLICATIONS This application is a continuation of copending International Patent Application No. PCT/US99/01116, filed Jan. 20, 1999 and further claims the benefit of U.S. Provisional Application No. 60/071,987, filed Jan. 20, 1998. The entire disclosures of International Patent Application No. PCT/US99/01116 and U.S. Provisional Application No. 60/071,987, each as filed, are incorporated herein by reference.

INT-CL: [07] G01 N 33/53, G01 N 33/543, C01 B 37/02, C04 B 38/00

US-CL-ISSUED: 435/7.2; 435/4, 435/7.1, 435/14, 436/518, 436/523, 436/524, 436/528, 423/702, 424/484, 424/489, 424/499
US-CL-CURRENT: 435/7.2; 423/702, 424/484, 424/489, 424/499, 435/14, 435/4, 435/7.1, 436/518, 436/523, 436/524, 436/528

FIELD-OF-SEARCH: 423/702, 424/484, 424/489, 424/499, 435/4, 435/7.1, 435/7.2, 435/14, 436/518, 436/523, 436/524, 436/528

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4937208	June 1990	Yamamoto	501/12
☐	5591453	January 1997	Ducheyne et al.	424/422
☐	5672556	September 1997	Pinnavaia et al.	502/63
☐	5795559	August 1998	Pinnavaia et al.	423/702
☐	5840271	November 1998	Carrazza et al.	423/700
☐	5849258	December 1998	Lujano et al.	423/700
☐	5919430	July 1999	Hasenzahl et al.	423/702
☐	5951962	September 1999	Muller et al.	423/702
☐	6027666	February 2000	Ozin et al.	252/301.4R
☐	6054111	April 2000	Antonietti et al.	419/2

OTHER PUBLICATIONS

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A. Monnier, F. Schuth, Q. Huo, D. Kumar, D. Margolese, R.S. Maxwell, G.D. Stucky, M. Kirshnamurty, P.M. Petroff, A. Firouzi, M. Janicke, B.F. Chmelka, "Cooperative Formation of Inorganic-Organic Interfaces in the Synthesis of Silicate Mesostructures", Science (1993), 261, pp. 1299-1303.
Q. Huo, R. Leon, P.M. Petroff, G.D. Stucky, "Mesostructure Design with Gemini Surfacants: Supercage Formation in a Three-Dimensional Hexagonal Array", Science (1995), 268, pp. 1324-1327.
Q. Huo, D.I. Margolese, G.D. Stucky, "Surfactant Control of Phases in the Synthesis of Mesoporous Silica-Based Materials", Chem. Mater. (1996), 8, pp. 1147-1160.
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Wei, Y., et al., "Synthesis of New Organic-Inorganic Hybrid Glasses", Chem. Mater. 2(4) pp. 337-339, (1990).

ART-UNIT: 1641

PRIMARY-EXAMINER: Le; Long V.

ASSISTANT-EXAMINER: Padmanabhan; Kartic

ATTY-AGENT-FIRM: Akin Gump Strauss Hauer & Feld, L.L.P.

ABSTRACT:

Mesoporous materials and a method for making such materials is disclosed in which the mesoporous materials are made by forming an aqueous solution having an organometallic compound; adding a solution comprising a pore forming material selected from the group consisting of monomeric polyols, polyacids, polyamines, carbohydrates, oligopeptides, oligonucleic acids, carbonyl functional organic compounds, and mixtures and derivatives of these materials to form a sol get matrix by polycondensation; drying the sot gel matrix; and removing the pore forming material from the dried sot-gel matrix to thereby form a mesoporous material. The mesoporous materials have pore diameters of from about 20 .ANG. to about 100 .ANG. and may be used with a biologically active agent immobilized within the pores of the mesoporous material and introduced into a biological system.

22 Claims, 19 Drawing figures

L2: Entry 2 of 6 File: USPT Feb 24, 2004

DOCUMENT-IDENTIFIER: US 6696258 B1
TITLE: Mesoporous materials and methods of making the same

Detailed Description Text (32):
The biologically active agent to be immobilized within the mesoporous material may be any type of cell, a portion of a cell, a microorganism, a virus, a nucleic acid, an enzyme, a polysaccharide, a polypeptide, a subunit of a polypeptide, a drug, a therapeutic agent, a diagnostic agent and or mixtures or derivatives of these compounds, so long as the agent has biological activity or activity in a biological system. Preferably, the biologically active agent may be immobilized, i.e., entrapped within the pores, by providing the biologically active agent to the sol-gel matrix while the matrix is being formed. However, it will be understood, based on this disclosure, that the biologically active agent can be provided to the mesoporous pores after formation of the matrix and removal of the pore forming material. It is preferred, however, that the biologically active agent is added during formation of the pore forming material, and more preferably, after adding the pore forming material. If an acid-catalyzed method is used, it is preferred that a neutralizing step be undertaken as described above, before introducing the biologically active agent.

Detailed Description Text (95):
Horseradish peroxidase (HRP) was directly immobilized in mesoporous silicon-based matrices using the procedure for sol-gel reactions as described in Example 3 in the presence of various pore forming materials according to the invention, including D-fructose (samples FH16-FH60), D-glucose (Samples GH33 and GH42), sucrose (Samples SH33 and SH42), and glycerol (Samples YH33 and YH42). The percentage of each pore forming material is expressed below in Table 5 based on the amount of silicon dioxide and organic compound, along with the mean V.sub.max based on the average V.sub.max from the Eadie-Hofstee plot and the Hanes-Woolf plot, as described in other Examples herein. Table 5 also provides the standard deviation for the V.sub.max data. Table 5 also sets forth the mean K.sub.m value, as described in other Examples herein, based on average K.sub.m from the Eadie-Hofstee plot and the Hanes-Woolf plot, including the standard deviations for this data.

WEST Search History

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DATE: Thursday, July 15, 2004

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☐	L5	L1 and mesoporous	0
☐	L4	l2 and implant$	28
☐	L3	(drug adj3 pore) same silicon	0
☐	L2	L1 and silicon	60
☐	L1	drug adj3 pore	278

END OF SEARCH HISTORY

L4: Entry 28 of 28 File: DWPI Jun 11, 1984

DERWENT-ACC-NO: 1984-180011
DERWENT-WEEK: 198429

TITLE: Drug impregnated porous ceramic - implanted into the body for the treatment of cancer or osteomyelitis etc

Basic Abstract Text (1):
Porous ceramic having pores with size 10-500 microns at least on its surface has anti-tumour agents and/or antibiotics impregnated in the pores. The porous ceramic can be prepd. by adding binder (e.g. clay) to ceramic powder with 10-500 micron particle size, moulding the mixt. into suitable form and firing the moulding. The firing is carried out so that pores on the surface are not closed. Pref. main component of the ceramic is calcium phosphate (e.g. hydroxy-apatite, tricalcium phosphate), alumina, zirconia or silicon azide.

Basic Abstract Text (2):
USE/ADVANTAGE - The ceramic is bedded in affected part of patients with osteomyelitis or malignant tumours. The drug impregnated in the ceramic pores shows good therapeutic effect for a long time. Further, the ceramic does not adversely affect the body.

Standard Title Terms (1):
DRUG IMPREGNATE POROUS CERAMIC IMPLANT BODY TREAT CANCER OSTEOMYELITIS

L4: Entry 27 of 28 File: USPT Dec 2, 1975

DOCUMENT-IDENTIFIER: US 3923969 A
TITLE: Carrier system for a drug with sustained release

Brief Summary Text (3):
The invention relates to a carrier, depot or bonding system for a drug which allows sustained release of the drug and which can be administered orally, externally or by implantation. The carrier material consists of physiologically innocuous, inorganic or organic materials which are totally or almost non-reabsorbable in the body. For its properties as a carrier of active pharmaceutical substances what is decisive is the special porous structure. It comprises so-called inkwell pores, i.e. it contains cavities connected to the outer surface of the bonding substance by passages (pore necks) which are narrow in relation to their diameters. The drug is embedded in the cavities.

Brief Summary Text (5):
Sustained release preparations make it possible for the dosage of a drug to be accurately controlled over a long period of time and for a plurality of active substances to be released on a set time schedule. A number of methods of obtaining sustained release are already known. For example, the drug may be enclosed in a capsule which will dissolve in the body after a certain amount of time or which allows the drug to diffuse through its porous wall. In the case of microincapsulation, the drug is enclosed in a large number of very small membrane capsules. Tablets may be coated with lacquers to achieve delayed release. The drug may be suspended in water, oil or buffer solutions. The drug may be etherified or esterified to put it in a form in which it is difficult to reabsorb. If the drug is applied as a crystal suspension or a crystal implant, its release will be delayed because its surfaces will be small relative to the amorphous substance. Absorption of the drug in carrier materials which can swell, such as gelatin, cellulose or certain plastics also delay release. If the drug is bonded by adsorption to large surfaces, release will be slow due to the low speed of desorption, as, e.g., in the case of the adsorbate innoculate or vaccine, a result of admixture with aluminium hydroxide. If a powdered drug is compressed together with powdered plastics, a porous tablet will form in which the plastic material will partly cover the surface of the powdered drug and will delay its release (see British Pat. No. 808,014, German Pat. No. 1,201,950 and U.S. Pat. No. 3,279,996).

Brief Summary Text (17):
Oxides such as silicon oxide, aluminium oxide, zirconium oxide, etc., can be prepared in highly porous form from the corresponding hydroxide gel by dehydration and drying at an elevated temperature (see, e.g., R.E. Kirk and D.F. Othmer, "Encyclopedia of Chemical Technology", Vol. 12, page 345 ff., New York, Interscience Publishers (1954); and E. Robens and G. Sandstede, "Z. Instrumentenkunde" 75 (1967), page 177). In another process (see K.S. Mazdiyasny, C.T. Lynch and J.S. Smith, J. Am. Ceramic Soc. 48 (1965), pages 372 - 375) alcoholates dissolved in organic solvents are converted, by hydrolysis and subsequent drying, into oxides with crystallites and pores in the sub-micron range,

Brief Summary Text (19):
The active substance may be deposited by steeping the bonding material in the

liquid or molten drug. It may be necessary first to cleanse the material of substances (such as water) which have been embedded in the cavities during manufacture. This can be done, e.g., by drying under vacuum at an elevated temperature. Solid drugs may be dissolved and incorporated or placed in the bonding material by steeping the latter in the solution. The solvent can then be removed by vaporization. If the drug is vaporizable or sublimable, it may be deposited or placed in the cavities by condensation out of the gas phase. Finally, the drug may be mixed with the starting materials before the preparation of the carrier material. As the carrier material is made, the drug becomes enclosed in the pores which are formed.

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☐ 1. Document ID: US 6730324 B2

Using default format because multiple data bases are involved.

L4: Entry 1 of 28 File: USPT May 4, 2004

US-PAT-NO: 6730324
DOCUMENT-IDENTIFIER: US 6730324 B2

TITLE: Biofunctional hydroxyapatite coatings and microspheres for in-situ drug encapsulation

DATE-ISSUED: May 4, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Troczynski; Tomasz	Vancouver			CA
Liu; Dean-Mo	Richmond			CA
Yang; Quanzu	Vancouver			CA

US-CL-CURRENT: 424/489; 424/400, 424/490, 424/497

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 2. Document ID: US 6409698 B1

L4: Entry 2 of 28 File: USPT Jun 25, 2002

US-PAT-NO: 6409698
DOCUMENT-IDENTIFIER: US 6409698 B1

TITLE: Perforate electrodiffusion pump

DATE-ISSUED: June 25, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Robinson; John N.	Gibsonia	PA	15044	
Burke; Paul F.	Bellingham	MA		
Fine; Kenneth A.	Sharon	MA		

US-CL-CURRENT: 604/19; 204/550, 417/48, 435/173.6, 604/501

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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☐ 3. Document ID: US 6365185 B1

L4: Entry 3 of 28 File: USPT Apr 2, 2002

US-PAT-NO: 6365185
DOCUMENT-IDENTIFIER: US 6365185 B1
**** See image for Certificate of Correction ****

TITLE: Self-destructing, controlled release peroral drug delivery system

DATE-ISSUED: April 2, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ritschel; Wolfgang A.	Cincinnati	OH		
Agrawal; Mukul A.	Strongsville	OH		

US-CL-CURRENT: 424/473; 424/464, 424/465, 424/466, 424/468, 424/469, 424/470, 424/471, 424/472

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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☐ 4. Document ID: US 6361780 B1

L4: Entry 4 of 28 File: USPT Mar 26, 2002

US-PAT-NO: 6361780
DOCUMENT-IDENTIFIER: US 6361780 B1

TITLE: Microporous drug delivery system

DATE-ISSUED: March 26, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ley; Gregory R.	New Brighton	MN		
Knapp; Christopher Paul	Oakdale	MN		

US-CL-CURRENT: 424/400; 424/422, 424/423, 424/432, 424/443, 424/484, 424/486, 604/264, 604/265

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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☐ 5. Document ID: US 6355270 B1

L4: Entry 5 of 28 File: USPT Mar 12, 2002

US-PAT-NO: 6355270
DOCUMENT-IDENTIFIER: US 6355270 B1
**** See image for Certificate of Correction ****

TITLE: Particles for oral delivery of peptides and proteins

DATE-ISSUED: March 12, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ferrari; Mauro	Dublin	OH		
Dehlinger; Peter J.	Palo Alto	CA		
Martin; Francis J.	San Francisco	CA		
Grove; Carl F.	Portola Valley	CA		
Friend; David R.	Menlo Park	CA		

US-CL-CURRENT: 424/489; 424/185.1, 424/450, 424/451, 514/2, 514/21, 530/300, 530/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 6. Document ID: US 6277411 B1
L4: Entry 6 of 28 File: USPT Aug 21, 2001

US-PAT-NO: 6277411
DOCUMENT-IDENTIFIER: US 6277411 B1

TITLE: Pharmaceutical formulation containing DFMO for the treatment of cancer

DATE-ISSUED: August 21, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Shaked; Ze'ev	Boston	MA		
McGinity; James	Austin	TX		

US-CL-CURRENT: 424/489; 424/490, 514/564

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 7. Document ID: US 6046177 A
L4: Entry 7 of 28 File: USPT Apr 4, 2000

US-PAT-NO: 6046177
DOCUMENT-IDENTIFIER: US 6046177 A

TITLE: Sulfoalkyl ether cyclodextrin based controlled release solid pharmaceutical formulations

DATE-ISSUED: April 4, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Stella; Valentino J.	Lawrence	KS		
Rajewski; Roger A.	Lawrence	KS		
Rao; Venkatramana M.	Lawrence	KS		
McGinity; James W.	Austin	TX		
Mosher; Gerold L.	Kansas City	MO		

US-CL-CURRENT: 514/58; 514/778, 514/964, 514/965, 536/103

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 8. Document ID: US 5869096 A

L4: Entry 8 of 28 File: USPT Feb 9, 1999

US-PAT-NO: 5869096
DOCUMENT-IDENTIFIER: US 5869096 A

TITLE: Oral osmotic device with hydrogel driving member

DATE-ISSUED: February 9, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Barclay; Brian L.	Sunnyvale	CA		
Childers; Jerry D.	Sunnyvale	CA		
Wright; Jeri	Dublin	CA		
Place; Virgil A.	Kawaihae	HI		
Wong; Patrick S. L.	Palo Alto	CA		

US-CL-CURRENT: 424/468; 424/435, 424/472, 424/473, 424/474

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 9. Document ID: US 5785994 A

L4: Entry 9 of 28 File: USPT Jul 28, 1998

US-PAT-NO: 5785994
DOCUMENT-IDENTIFIER: US 5785994 A

TITLE: Method for administering drug to gastrointestinal tract

DATE-ISSUED: July 28, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wong; Patrick S.-L.	Palo Alto	CA		
Theeuwes; Felix	Los Altos	CA		
Ayer; Atul Devdatt	Palo Alto	CA		
Kuczynski; Anthony L.	Palo Alto	CA		

US-CL-CURRENT: 424/473; 424/468, 424/472

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 10. Document ID: US 5776493 A

L4: Entry 10 of 28 File: USPT Jul 7, 1998

US-PAT-NO: 5776493
DOCUMENT-IDENTIFIER: US 5776493 A

TITLE: Oral osmotic device for delivery of nystatin with hydrogel driving member

DATE-ISSUED: July 7, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Barclay; Brian L.	Sunnyvale	CA		
Childers; Jerry D.	Sunnyvale	CA		
Wright; Jeri	Dublin	CA		
Place; Virgil A.	Kawaihae	HI		
Wong; Patrick S.-L.	Palo Alto	CA		

US-CL-CURRENT: 424/468; 424/435, 424/472, 424/473, 424/474

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 11. Document ID: US 5573776 A

L4: Entry 11 of 28 File: USPT Nov 12, 1996

US-PAT-NO: 5573776
DOCUMENT-IDENTIFIER: US 5573776 A
**** See image for Certificate of Correction ****

TITLE: Oral osmotic device with hydrogel driving member

DATE-ISSUED: November 12, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Harrison; Juan M. E.	Mountain View	CA		
Barclay; Brian L.	Sunnyvale	CA		

Childers; Jerry D.	Menlo Park	CA
Wright; Jeri D.	Dublin	CA
Place; Virgil A.	Kawaihae	HI
Wong; Patrick S.	Palo Alto	CA

US-CL-CURRENT: 424/435; 424/434, 424/468, 424/473

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 12. Document ID: US 5380329 A

L4: Entry 12 of 28 File: USPT Jan 10, 1995

US-PAT-NO: 5380329
DOCUMENT-IDENTIFIER: US 5380329 A

TITLE: Bone augmentation method and apparatus

DATE-ISSUED: January 10, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Elia; James P.	Scottsdale	AZ		
Bains; Jerry W.	Scottsdale	AZ		

US-CL-CURRENT: 606/72; 606/86

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 13. Document ID: US 5324294 A

L4: Entry 13 of 28 File: USPT Jun 28, 1994

US-PAT-NO: 5324294
DOCUMENT-IDENTIFIER: US 5324294 A

TITLE: Bone augmentation method and apparatus

DATE-ISSUED: June 28, 1994

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Elia; James P.	Scottsdale	AZ		
Bains; Jerry W.	Scottsdale	AZ	85377	

US-CL-CURRENT: 606/76

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 14. Document ID: US 5248310 A

L4: Entry 14 of 28 File: USPT Sep 28, 1993

US-PAT-NO: 5248310
DOCUMENT-IDENTIFIER: US 5248310 A

TITLE: Oral osmotic device with hydrogel driving member

DATE-ISSUED: September 28, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Barclay; Brian L.	Sunnyvale	CA		
Childers; Jerry D.	Sunnyvale	CA		
Wright; Jeri D.	Dublin	CA		
Place; Virgil A.	Kawaihae	HI		
Wong; Patrick S.-L.	Palo Alto	CA		

US-CL-CURRENT: 604/891.1; 424/468, 424/471, 424/473, 604/890.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 15. Document ID: US 5232705 A

L4: Entry 15 of 28 File: USPT Aug 3, 1993

US-PAT-NO: 5232705
DOCUMENT-IDENTIFIER: US 5232705 A

TITLE: Dosage form for time-varying patterns of drug delivery

DATE-ISSUED: August 3, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wong; Patrick S.	Palo Alto	CA		
Theeuwes; Felix	Los Altos	CA		
Ayer; Atul D.	Palo Alto	CA		
Kuczynski; Anthony L.	Palo Alto	CA		

US-CL-CURRENT: 424/473; 424/468, 424/472

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 16. Document ID: US 5200194 A

L4: Entry 16 of 28 File: USPT Apr 6, 1993

US-PAT-NO: 5200194
DOCUMENT-IDENTIFIER: US 5200194 A

TITLE: Oral osmotic device

DATE-ISSUED: April 6, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Edgren; David E.	El Granada	CA		
Bhatti; Gurdish K.	Fremont	CA		

US-CL-CURRENT: 424/473; 424/468, 424/472

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 17. Document ID: US 5156850 A

L4: Entry 17 of 28 File: USPT Oct 20, 1992

US-PAT-NO: 5156850
DOCUMENT-IDENTIFIER: US 5156850 A

TITLE: Dosage form for time-varying patterns of drug delivery

DATE-ISSUED: October 20, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wong; Patrick S.	Palo Alto	CA		
Theeuwes; Felix	Los Altos	CA		
Ayer; Atul D.	Palo Alto	CA		
Kuczynski; Anthony L.	Palo Alto	CA		

US-CL-CURRENT: 424/473; 424/472

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 18. Document ID: US 5053032 A

L4: Entry 18 of 28 File: USPT Oct 1, 1991

US-PAT-NO: 5053032
DOCUMENT-IDENTIFIER: US 5053032 A

TITLE: Method of signalling a patient during buccal agent delivery

DATE-ISSUED: October 1, 1991

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Barclay; Brian L.	Sunnyvale	CA	94087	
Childers; Jerry D.	Sunnyvale	CA	94086	
Wright; Jeri	Dublin	CA	94568	
Place; Virgil A.	Kawaihae	HI	96743	
Wong; Patrick S. L.	Palo Alto	CA	94306	

US-CL-CURRENT: 604/892.1; 424/465

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 19. Document ID: US 5028435 A

L4: Entry 19 of 28 File: USPT Jul 2, 1991

US-PAT-NO: 5028435
DOCUMENT-IDENTIFIER: US 5028435 A

TITLE: System and method for transdermal drug delivery

DATE-ISSUED: July 2, 1991

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Katz; Martin	Menlo Park	CA		
Nacht; Sergio	Los Altos	CA		
Heller; Jorge	Woodside	CA		

US-CL-CURRENT: 424/484; 424/447, 424/448, 424/449, 424/486

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 20. Document ID: US 5021053 A

L4: Entry 20 of 28 File: USPT Jun 4, 1991

US-PAT-NO: 5021053
DOCUMENT-IDENTIFIER: US 5021053 A

TITLE: Oral osmotic device with hydrogel driving member

DATE-ISSUED: June 4, 1991

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Barclay; Brian L.	Sunnyvale	CA		
Childers; Jerry D.	Sunnyvale	CA		
Wright; Jeri	Dublin	CA		
Place; Virgil A.	Kawaihae	HI		

Wong; Patrick S. L. Palo Alto CA

US-CL-CURRENT: 604/892.1; 424/468

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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21. Document ID: US 4906488 A

L4: Entry 21 of 28 File: USPT Mar 6, 1990

US-PAT-NO: 4906488
DOCUMENT-IDENTIFIER: US 4906488 A

TITLE: Modification of permeant

DATE-ISSUED: March 6, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Pera; Ivo E.	Pisa			IT

US-CL-CURRENT: 426/573; 264/4.1, 264/4.7, 424/419, 424/486, 424/76.3, 426/533, 426/534, 426/650, 426/651, 512/4, 514/944 , 514/965, 516/102

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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22. Document ID: US 4673405 A

L4: Entry 22 of 28 File: USPT Jun 16, 1987

US-PAT-NO: 4673405
DOCUMENT-IDENTIFIER: US 4673405 A

TITLE: Osmotic system with instant drug availability

DATE-ISSUED: June 16, 1987

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Guittard; George V.	Cupertino	CA		
Deters; Joseph C.	Mountain View	CA		
Theeuwes; Felix	Los Altos	CA		
Cortese; Richard	San Jose	CA		

US-CL-CURRENT: 424/473; 424/467

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 23. Document ID: US 4576604 A

L4: Entry 23 of 28 File: USPT Mar 18, 1986

US-PAT-NO: 4576604
DOCUMENT-IDENTIFIER: US 4576604 A

TITLE: Osmotic system with instant drug availability

DATE-ISSUED: March 18, 1986

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Guittard; George V.	Cupertino	CA		
Deters; Joseph C.	Mountain View	CA		
Theeuwes; Felix	Los Altos	CA		
Cortese; Richard	San Jose	CA		

US-CL-CURRENT: 424/473; 424/431, 424/436, 604/892.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

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☐ 24. Document ID: US 3993072 A

L4: Entry 24 of 28 File: USPT Nov 23, 1976

US-PAT-NO: 3993072
DOCUMENT-IDENTIFIER: US 3993072 A

TITLE: Microporous drug delivery device

DATE-ISSUED: November 23, 1976

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Zaffaroni; Alejandro	Atherton	CA		

US-CL-CURRENT: 424/430; 128/833, 424/423, 424/424, 424/432, 424/433, 424/434, 424/435, 424/436, 424/473

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

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☐ 25. Document ID: US 3962414 A

L4: Entry 25 of 28 File: USPT Jun 8, 1976

US-PAT-NO: 3962414
DOCUMENT-IDENTIFIER: US 3962414 A

TITLE: Structured bioerodible drug delivery device

DATE-ISSUED: June 8, 1976

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Michaels; Alan S.	Atherton	CA		

US-CL-CURRENT: 424/473; 424/469, 424/480, 424/481

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 26. Document ID: US 3948254 A

L4: Entry 26 of 28 File: USPT Apr 6, 1976

US-PAT-NO: 3948254
DOCUMENT-IDENTIFIER: US 3948254 A

TITLE: Novel drug delivery device

DATE-ISSUED: April 6, 1976

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Zaffaroni; Alejandro	Atherton	CA		

US-CL-CURRENT: 128/833; 424/423, 424/426, 424/432, 424/434, 424/435, 424/436, 424/437, 424/449, 604/515, 604/516, 604/57

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 27. Document ID: US 3923969 A

L4: Entry 27 of 28 File: USPT Dec 2, 1975

US-PAT-NO: 3923969
DOCUMENT-IDENTIFIER: US 3923969 A

TITLE: Carrier system for a drug with sustained release

DATE-ISSUED: December 2, 1975

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Baukal; Werner	Kronberg, Taunus			DT
Kinkel; Heinz-Joachim	Schwalbach, Taunus			DT
Robens; Erich	Friedrichsdorf			DT
Walter; Gerhard	Steinbach			DT

US-CL-CURRENT: 424/468; 424/469, 424/484, 514/770

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 28. Document ID: JP 59101145 A

L4: Entry 28 of 28 File: DWPI Jun 11, 1984

DERWENT-ACC-NO: 1984-180011
DERWENT-WEEK: 198429

TITLE: Drug impregnated porous ceramic - implanted into the body for the treatment of cancer or osteomyelitis etc

PRIORITY-DATA: 1982JP-0209842 (November 30, 1982)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 59101145 A	June 11, 1984		003	

INT-CL (IPC): A61F 1/00; A61K 9/00; C04B 21/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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L4: Entry 4 of 28 File: USPT Mar 26, 2002

DOCUMENT-IDENTIFIER: US 6361780 B1
TITLE: Microporous drug delivery system

Abstract Text (1):
A drug delivery device is described comprising a porous biocompatible solid having at least one therapeutic drug within its pores, the therapeutic drug being removable from the pores by immersion in an aqueous solution. This may also be described as a drug delivery device comprising a porous annulus comprising a biocompatible solid having at least one therapeutic drug within its pores, the therapeutic drug being removable from the pores by immersion in an aqueous solution, the annulus having a top outer surface with an outside diameter, an inner surface with an inside diameter, and a side surface, at least one of the side surface and the top outer surface having openings of the pores exposed on that surface.

Brief Summary Text (2):
The present invention relates to drug delivery devices, particularly to temporary or long-term implanted drug delivery devices, and particularly to drug delivery devices which may be associated with other devices used for medical treatment.

Brief Summary Text (7):
The use of controlled release implants for administering estradiol to ruminant animals has been described in U.S. Pat. No. 4,191,741. During implantation of such implants, conditions may be unsanitary, causing infections which could lead to loss of the implant. Use of an antibiotic or germicide layer, or a coating on the surface of the implant to reduce infections and to improve implant retention has been described in U.K. Patent No. 2 136 688 A. There an antibiotic coating facilitates parenteral administration of the implants under non-sterile conditions. Requirements for cleaning any implant needle, the site of implantation, and the implantation itself are minimized or reduced. Other infection-resistant implant materials have been described in the art, such as in U.S. Pat. No. 4,581,028 which describes infection-resistant materials suitable for use as vascular graft prostheses or other implanted devices.

Brief Summary Text (8):
It is known that antimicrobial agents can be layered or coated onto the surface of an implant to inhibit infection at the site of implantation. However, some difficulties have been encountered in implementing that technology. Surface-applied antimicrobial agents have been found to be easily dislocated from the surface of the implant by nominal mechanical activity on the implants, including during packaging. Loss of antimicrobial coating reduces the activity of the treatment significantly. Coating uniformity may also be difficult to control.

Brief Summary Text (11):
U.S. Pat. No. 4,819,662 describes a device referred to as a steroid lead and a process for providing medical activity through introduced chemistry in a cardiac electrode. The invention comprises an implantable cardiac pacing lead including a porous platinum electrode, a flexible electrically conductive coil, and a crimp tube coupling the electrode to the distal end of the coil. There is a recess in the crimp tube, open to the electrode at the crimp distal tube end, which houses a

matrix impregnated with a therapeutic drug. The electrode itself is highly porous and may be loaded with a therapeutic drug in liquid or solid form. The drug, because of its highly porous exposure to the environment, is immediately released upon implantation of the cardiac pacing device. A variety of different matrices carrying therapeutic drugs may be housed in the recess to provide elution of different drugs and at different rates.

Brief Summary Text (12):
U.S. Pat. No. 4,846,844 describes an improved antimicrobial implant coating comprising a silicone fluid in contact with the surface of the implant and a microbial agent in contact with the silicone fluid. The silicone fluid may be first applied to the implant and the antimicrobial agent may be applied to the fluid, for example as a dust applied to the liquid coating. The effectiveness of the application is asserted to derive from the high affinity of the silicone fluid to both the implant surface and to the antimicrobial agent.

Brief Summary Text (15):
The drug delivery element is microporous, with open pores on its exterior and at least part way through the body of the drug delivery element so that drug may elute out of the pores into the body. The drug delivery element is microporous (rather than porous) so that the drug is delivered over an extended period of time rather than immediately released into any liquid environment into which it is placed. The size of the pores, the viscosity of the liquid (or solid fill when it is wet by the environment), the physical relationship between the drug and the walls of the pores (e.g., mutually attractive, neutrally attractive, or repulsive, such as based upon their relative hydrophilicity or hydrophobicity) will assist in determining or tailoring the rate of release of the drug into the biological system into which the drug delivery element is introduced.

Brief Summary Text (16):
The drug delivery element offers simplicity in manufacture and loading of the drug into the drug delivery element. Once the porous element has been manufactured, the various drugs may be provided to the device simply by immersing the drug delivery element into a solution, dispersion, emulsion, or suspension of the drug, allowing the drug to penetrate into the pores, and then the device is dried or maintained in a desired wet state. The collar or annulus may also provide a stiffening effect to the leading edge of a catheter or lead to facilitate its positioning or movement through a patient. Collars or annular elements may also be manufactured (during the shaping of the collar or annulus) by mixing the porous matrix forming composition with the drug to be delivered, and then shaping the collar or annulus by hardening the matrix forming material in a mold or press.

Detailed Description Text (3):
The invention includes a drug delivery device comprising a porous biocompatible solid having at least one therapeutic drug within its pores, the therapeutic drug being removable from said pores by immersion in an aqueous solution. This may also be described as a drug delivery device comprising a porous annulus comprising a biocompatible solid having at least one therapeutic drug within its pores, the therapeutic drug being removable from the pores by immersion in an aqueous solution, the annulus having a top outer surface with an outside diameter, an inner surface with an inside diameter, and a side surface, at least one of the side surface and the top outer surface having openings of the pores exposed on that surface. The device may comprise pores having an average size of the greatest dimensions within the pores of between about 10.sup.-6 and 10.sup.-1 mm. The drug will be released in a timed manner upon contact with any bodily fluid, including blood, serum, gastric fluids, bile, saliva, and the like.

Detailed Description Text (6):
The drug delivery element of the present invention generally comprises a microporous carrier system, the pores of which contain a therapeutic compound or

composition which can be released by immersion or contact with a liquid medium. By microporous it is meant that continuous pores (e.g., in a reticulated or penetrating network of pores) do not have diameters greater than 0.1 mm. It is preferred that there be no pore diameters on the external surface of the drug delivery element which are greater than 0.1 mm, and preferably all of the pores throughout the body of the carrier of the drug delivery element are less than 0.1 mm. It is more preferred that the pore diameter of pores on the external surface be less than 0.05 mm, preferably less than 0.03 mm, more preferably less than 0.02 mm, and most preferably less than 0.01 and less than 0.005 mm. The pore diameter will depend upon a number of factors, including but not limited to the desired drug delivery rate, the solubility of drug within the expected liquid medium into which the drug delivery element will be immersed, the viscosity of any liquid drug system within the pores, the relative surface tension between the liquid drug system within the pores, the solubility or absorption rate of the drug with respect to the intended liquid medium into which it is placed, and the dimensions of the drug delivery element. It is generally found that pores greater than 0.2 micrometers, preferably pores having average diameters (or largest dimensions as they may not be perfectly round, but irregularly shaped or ovoid) of at least 0.3, at least 0.4 or at least 0.5 or 1.0 micrometers, and preferably between 10.sup.-6 and 10.sup.-1 mm or between 10.sup.-6 and 10.sup.-2 mm or between 10.sup.-6 and 10.sup.-6 mm or between 10.sup.-6 and 10.sup.-5 mm provide a suitable working range of maximum pore diameters for extended drug delivery of from a few minutes to months. The length of the collar or annulus may be within the range of whatever dimensions are tolerable within the patient, such as 0.01 mm to 5 or 10 cm.

Detailed Description Text (7):
The drug delivery element is conveniently provided as a collar or annulus which can be positioned over a conventional medical element such as a catheter, stent, electrical lead, electrode, wire, fixation helix, artificial vasculature, tube, sensing device (e.g., motion sensor, pressure sensor, etc.) and the like which is to be inserted or implanted into a patient. The collar may be premade and slid into place over the device, the collar may have a slit in it so that it can slightly open to a larger dimension to be slid over the device and then clamp slightly tighter to maintain its position, grooves may be provide on the device and a snap or pinning fixation by a bump or protuberance inside the open area of the collar may fix its position, or the collar may be molded onto the device at the desired location. The collar is desirably of sufficient rigidity that it will not bend, stretch or flex so much that its porosity greatly changes during the flexing. For example, as the collar is placed under stress, its natural response is to bend. However, when a porous element bends, the pore sizes (particularly on the surface) can distort so that the rate of release can change. When a surface bows out, for example, the rate of release will tend to increase as the pore openings on the surface will tend to expand. Useful materials for making the porous collar may be from a wide variety of biocompatible materials such as ceramics (e.g., inorganic metal oxides such as aluminum oxide, silica, zirconium oxide, titanium oxide, and composites of mixtures of inorganic oxides), metals (such as titanium, stainless steel, aluminum, and alloys), composite materials (mixtures of polymeric materials, metals, and/or inorganic oxides), and polymeric materials. It is well know within the art how to select from amongst a wide range of materials which would be useful within the practice of the present invention. The different materials would lend themselves to a variety of different manufacturing processes.

Detailed Description Text (8):
Ceramic materials can be fabricated at both room temperatures and elevated temperatures and so can be provided as both separate collars or as collars on substrates which could suffer from exposure to elevated temperatures. For example, many ceramics can be formed by solidification (dehydration) of sol-gel dispersions or suspensions of inorganic oxide particles. Other ceramics must be dehydrated and bonded together at elevated temperatures. By controlling the pressure applied to the ceramic material during hardening or fusing, the pore size can be controlled.

The use of ceramic-forming particles of different average sizes will also affect the average pore size according to conventional packing and distribution laws. Metal particles may have to be fused at elevated temperatures and therefore cannot be readily formed directly on surfaces which would be adversely affected by the fusion temperature needed for metal particles. Metal particles may be bonded onto a surface with an adhesive acting to bond the particles with a particle-surface coating matrix which does not fill the pores. In fact, by proper selection of the amount (the relative amount of polymer binder to metal), the pore size can be tightly controlled and the metal/binder collars applied to a wide array of surfaces easily. Various types of polymer binders such as thermoplastic binders (applied by melting the polymer of applied from solution, dispersion, emulsion or suspension or even direct polymerization on the surface of the polymers by heat, catalysis, or radiation), thermoset binders (also provided by reaction on the surface of the particles) or by fusion of the particles (with or without additional cross linking), or the like. Amongst the useful classes of polymers would be at least included the polyamides, polyacrylates, polyurethanes, silicon polymers (e.g., polysiloxanes, silicone rubbers, siloxane graft or block polymers or copolymers, etc.), polyester resins, highly fluorinated resins (e.g., polytetrafluoroethylene), polyimides, and the like. These same classes of polymers may also comprise the mass of the drug delivery element itself. Particularly when latices are used to mold the collar or particles are fused (thermally or by solvents) to form the collar, the degree of pressure applied, the level of heat applied, the duration of the solvent, and other obvious parameters may be used to control the degree of fusion of the polymer and its degree of porosity. Porosity can also be created in polymeric materials useful for the collar by including a soluble or leachable or flowable pore-leaving component with the polymer, forming the collar, and then removing the pore-leaving component. Amongst the more well known techniques in this category is mixing a highly soluble particle (soluble in a solvent in which the polymer is not soluble), such as NaCl, into the polymer. Casting or molding the collar, and then leaching out or dissolving out the salt with water. By controlling the volume of salt, and the size of the salt particles, the pore size can be readily controlled. Alternatively, it is known to mix a non-solvent liquid from the polymer to form an emulsion or dispersion. When the polymer is solidified as a collar, the non-solvent remains as a dispersed phase which can be readily removed from the collar by washing. Thermoplastic particles may be fused under controlled pressure to form a collar with controlled pore size, as with the ceramics and the metal particles.

Detailed Description Text (11):
FIG. 2 shows a collar 20 on a catheter 22 with a lumen 24. The collar 20 firmly surrounds the catheter 22. The side 34 of he collar 20 shows three layers 26, 28 and 30 of different pore sizes, with the largest pore sizes being closest to the catheter 22 and the smallest being farthest from the catheter 22 in layer 30. This type of pore distribution would actually be most effective where the side 34 of the collar 20 was not exposed directly to any immersion medium (e.g., a coating was present over the side 34). This would cause the concentration pressures to drive the drug within the pores from the lowest layer 26 through the middle layer 28 to the highest layer 30 to exits from the pores on the top outer surface 32. The dimensions of the collar 20 may vary dependent upon its ultimate use. Looking again at FIG. 1, the outside diameter (O.D.) Is limited only by the physical limitation of the element into a patient. A normal size range for this utility would be from about 0.5 mm to 5 mm, preferably between about 0.5 and 3 mm, more preferably between 0.5 and 1 or 2 mm. The inside diameter (I.D.) would be smaller than the O.D. and could easily range from about 0.3 or 0.4 to 4.9 mm, allowing a thickness (t) of from about 0.1 mm to 4.4 mm for the collar 2. The I.D. could also range from about 0.4 to 4.0 (or 3.9) mm, from about 0.4 to 3.0 (or 2.9) mm, or 0.4 to 2 (or 1.9) mm. The volumetric porosity of the collar may be controlled and tailored according to the ultimate use and needs of the system. Generally, however, the collar would be provided with a volumetric porosity of from about 7 to 60% by volume of pores, more likely from about 10 to 40% volume of pores in the collar 2, and more narrowly as from 15 to 35% by volume of pores in the collar 2. A specific

example of a collar made according to the present invention was a ceramic collar comprising inorganic oxides (.gtoreq.99.5% Aluminum oxide) with a 20-25% volumetric porosity, having a length of 0.040 inches (0.11 cm), and internal diameter of 0.060 inches (0.16 cm), and an external diameter of 0.090 inches (0.24 cm) formed by firing the aluminum oxide at 1000.degree. C. under controlled pressure. The average pore size was measured at about 1 to 5 microns or between 1.times.10.sup.-3 and 5.times.10.sup.-3 mm. The collar was immersed in an aqueous solution of dexamethasone acetate for a few minutes and then removed and dried in a sterile environment. The dried collar was then immersed in water and the dextramethasone acetate was removed from the pores over time. This steroid could be used in vivo with a catheter or lead because of the biocompatible composition of the collar material (the aluminium oxide) and the use fulness of dexamethasone acetate as a delivered drug. The pores made by the particular method of this example extended only 10 micrometers in depth from the top outer surface of the collar, which was sufficient for release of the drug according to the present invention. Fifteen samples of this type of collar were tested for levels of loading with dexamethasone acetate and the data is shown in the following table.

CLAIMS:

1. A drug delivery device comprising a rigid porous biocompatible solid in the shape of a collar or annulus having an exterior surface that defines an opening therethrough, and a medical device having an outer surface where the outer surface of the medical device passes through the opening and is fixed to the rigid porous biocompatible solid, and where the rigid porous biocompatible has at least one therapeutic drug within its pores, said therapeutic drug being removable from said pores by immersion in an aqueous solution.

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L4: Entry 24 of 28 File: USPT Nov 23, 1976

DOCUMENT-IDENTIFIER: US 3993072 A
TITLE: Microporous drug delivery device

Brief Summary Text (2):
This invention relates to a novel and useful drug delivery device for releasing drug at a controlled rate for a prolonged period of time to produce a local or systemic physiological or pharmacological effect. The drug delivery device is comprised of a reservoir surrounded by a wall. The reservoir is comprised of a drug within a solid carrier permeable to the passage of the drug and in which the drug has limited solubility. The wall of the device is comprised in at least a part of a microporous material, the pores of which contain a drug release rate controlling medium permeable to the passage of the drug. Both the solid drug carrier and the medium present in the pores of the microporous wall are permeable to the passage of drug, as by diffusion, but the permeability of the medium to the drug is lower than the permeability of the solid carrier to the drug. Accordingly, drug released through the medium in the pores of the wall is the drug release rate controlling step for releasing drug from the drug delivery device of the invention.

Drawing Description Text (7):
FIG. 5 is a schematic drawing showing a drug delivery implant that keeps its original mechanical shape and is fabricated in accordance with the invention;

Detailed Description Text (5):
FIG. 3 represents a schematic drawing of a pill or tablet peroral drug delivery device 10 of the invention. This device 10 is comprised in at least a part of a wall 11 formed of a microporous material whose pores contain a liquid permeable to the passage of drug, as by diffusion, and it is also comprised in the remaining part of a wall 16 formed of a non-porous material, impermeable to the passage of drug. Wall 11 and wall 16 are made of essentially non-swellable materials and they enclose a reservoir 12 (shown in opened section) containing drug 14 in solid drug carrier 13. Carrier 13 is fabricated of a soidified material that remains in reservoir 12 during drug release and is permeable to the passage of drug, but the rate of passage of drug is higher in it than is the rate of passage of drug through the liquid in pores 15 of wall 11 so that drug release by the medium in the pores 15 of wall 11 is the drug release rate controlling step for releasing drug from the drug delivery device. The pill or tablet drug delivery devices are suitable for oral administration for continuously metering the flow of an effective amount of drug over a prolonged period of time to the gastrointestinal tract.

Detailed Description Text (6):
FIG. 4 illustrates another drug delivery device of the invention. In FIG. 4, a drug delivery device 10 designed for administering drug within a body opening, and anal canal, not shown. Drug delivery device 10 of FIG. 4 is comprised of a microporous wall 11 surrounding a reservoir 12. Reservoir 12 is comprised of a drug carrier 13 containing drug 14. Drug carrier 13 is solid in nature. Carrier 13 is chemically distinct from the drug and it is permeable, as by diffusion, to the passage of drug 14, which has limited solubility therein. Wall 11 is made of microporous materials that can be visualized as a plurality of sponge-like fused particles which provide a supporting structure having therethrough a dispersion of microscopic sized interconnecting voids or pores. Wall 11 can be isotropic, wherein the structure is

homogeneous throughout the cross-section of the wall, or wall 11 can be anisotropic wherein the structure is non-homogenous throughout the cross-section of the wall. The materials forming wall 11 are insoluble in body fluids. Pores 15 of wall 11 contain a medium, not shown, permeable to the passage of drug 14, as by diffusion, and it releases drug from the device at a predetermined, controlled rate within the body. In this device, as with the device discussed above, drug released from carrier 13 is replenished by undissolved drug dissolving in solid carrier 13 to insure that drug is continuously available to wall 11. Also, in the device of FIG. 4, release of drug through the medium in pores 15 of wall 11 is the rate controlling step for release of drug from this device.

Detailed Description Text (7):
In FIG. 5, there is illustrated a drug delivery device 10 for use as a depot implant. Device 10 is comprised of a wall 11 and a wall 17 surrounding a reservoir, not shown in this figure. Wall 11 and wall 17 are removably secured to the face of a pair of stainless steel washers 19 and 20 respectively. Two or more stainless steel U-shaped clips 21 and 22 are placed about washers 19 and 20 to clamp them tightly against wall 11 and wall 17 surrounding the reservoir. Wall 11 and wall 17 are formed from resilient materials and they will be compressed by clips 21 and 22. Wall 11 and wall 17 will tend to expand under the bias of clips 21 and 22 and hence form a tight seal with the periphery of wall 11 and wall 17.

Detailed Description Text (12):
While the above FIGS. 1 through 6 and latter described FIGS. 7 and 8 are illustrated of various drug delivery devices that can be made according to the invention, it is to be understood that these drug delivery devices are not to be construed as limiting, as the drug delivery devices of the invention can take a wide variety of shapes, sizes and forms for administering the drug at controlled rates to different areas of the body or to different drug receptor sites. For example, the invention includes external and internal drug delivery devices such as skin patches, sublingual or buccal drug delivery devices, peroral devices, arterial devices, nasal and ear drug delivery devices, suture materials, plastic heart valves, Stan-Edwards heart valves, hip joints, non-thrombogenic hydrocephalus shunt, bone pines, pessaries, prosthesis, artificial glands, cervical rings, troches, intrauterine drug delivery devices of cylindrical, bullet, elliptical, circular, bulbous, loops, bows, or any other geometrical shape that readily lends itself to intrauterine placement such as Birnberg's Bow in U.S. Pat. No. 3,319,625; Comet in U.S. Pat. No. 3,256,878; Majzlin Spring in U.S. Pat. No. 3,397,691; Inhiband in U.S. Pat. No. 3,323,520; Bakunin in U.S. Pat. No. 3,405,711; Shamrock in U.S. Pat. No. 3,077,897; the ring with tail; Ota ring and the like. In each instance, all of the drug delivery devices made according to the invention have a reservoir comprised of a drug and a solid drug carrier permeable to the passage of drug as by diffusion. The reservoir is surrounded by a wall, at least a portion of which is comprised of a microporous material whose micropores are filled with a diffusive media which is permeable to the passage of drug as by diffusion. The drug rate of release through the media in the microporous wall is lower than the rate of passage through the carrier, so that the drug release rate through the media in the wall is the drug release rate controlling step. Also, all of the drug delivery devices are of appropriate known shapes and sizes for implantation, insertion or positioning in the desired body cavities or on tissues for administering of drug to the body or to a drug receptor site.

Detailed Description Text (17):
These two structures, comprising the unit drug delivery device, operate to effectively transfer drug from the device by first transferring drug from the carrier to the microporous wall, and secondly, by transferring drug through the media in the pores of the wall to a drug recipient. The transfer of drug through the media in the microporous wall occur by solution and diffision, and it is sometimes referred to as diffusive flow. It is referred to in the specification and accompanying claims as diffusion. In the diffusion process, the druge dissolves in

a media or mixture of media in the micropores of the wall and then diffuses in the direction of lower chemical potential. At the second boundary equilbrium is again established. When the boundary conditions on both sides of the wall are maintained constant, a steady state flux of the drug will be established which can be described by Fick's Law of Diffusion. The rate of passage of drug through the media in the microporous wall material is generally dependent, in the case of diffusion, on the solubility of the drug in the media, as well as on the diffusion coefficient and on the size of the pores and the porosity and tortuosity of the material. This means that selection of appropriate materials for fabricating the wall will be dependent on the particular microporous wall, the media and the drug to be used. In the device of the invetion when the radius of the micropores is at least 10 times larger than the molecular radius of the drug molecule, there is no interaction between the wall material and the drug molecule. In this case, the drug diffusion coefficient will be the same as drug diffusion coefficient through a stagnant layer of the diffusive media. When the radius of the micropores is reduced to about 2 to 3 times the molecular radius of the drug molecule, interaction between the wall structure and the drug molecule can occur and will result in a lowering of the drug diffusion coefficient as hereinafter described. When the ratio of the radius of the micropore to that of the drug molecule is significantly lower than 2 to 3, it can be considered to be a solution diffusive membrane. Thus, by choosing the microporous wall material, and the release rate controlling media in the pores, the rate of passage of drug through the media ensures that the release kinetics of the device are controlled by the release rate of drug through the media in the microporous wall. Thus, by choosing the micropores and its media wall, a zero order release of drug, or a time release pattern of drug to the body or drug receptor site can be achieved.

Detailed Description Text (25):
The diffusive medium suitable for the immersion purpose are those well known to the art such as water, silicon oil, castor oil, olive oil, mixed oils, emulsions of castor oil in non-aqueous solutions of pigskin gelatin, emulsions of gum arabic, condensation products of castor oil and ethylene oxide combining about 30 to 35 moles of ethylene oxide per mole of castor oil, emulsifying and suspending agents such as methyl cellulose mixed with water, gum tragacanth, polymeric sodium alginate, cross-linked poly(vinylpyrrolidone), insoluble, non-solids plasticizers, fatty acids; assorted waxes; and the like. Representative mediums are set forth in Remington's Pharmaceutical Science, pages 246 to 269 and 1338 to 1390, 1970, published by Mack Publishing Company, Easton, Pa.

Detailed Description Text (50):
Using the procedures and formulas above described, one skilled in the art can design a drug delivery device according to the invention by ascertaining the properties of the diffusive medium present in the micropores of the wall and the properties of the carrier forming material and then fabricating a drug delivery device by selecting a solid carrier in which the drug is permeable at a higher rate than the permeability of the drug in the medium in the pores of the wall. As an example for employing the teachings of this invention, consider a device consisting of a solid carrier in the shape of a thin slab of total thickness 1' bounded on all sides by a microporous membrane whose permeability to drug has been determined as J.sub.m g/cm.sup.2 sec, wherein m refers to the diffusive media in the micropores. Let the total drug loading of the carrier material be represented by the expression .phi..sub.c g/cm.sup.3, while the concentration of drug dissolved in the carrier be some lesser value represented by the expression C.sub.c g/cm.sup.3 and let the drug diffusion coefficient in the carrier be D.sub.c. Then, after a time L, a quantity of J.A.L. grams of drug where A is the area will leave the carrier, mainly from those parts of the solid carrier which are immediately adjacent to the microporous membrane, leaving a layer of carrier next to the microporous wall of 1" thickness which contains no dispersed drug. Since, it is known to those versed in the art that the maximum rate of movement of drug in the microporous wall after time L is given by the expression D.sub.c C.sub.c /1", which in turn is given by

the expression D.sub.c C.sub.c /J.sub.m L.phi..sub.c.

Detailed Description Text (59):
A drug delivery implant device comprising a reservoir containing a drug in a solid carrier surrounded by a microporous drug release rate controlling wall is manufactured as follows: first, 25 parts by weight of milled crystals of progesterone are mixed with 70 parts by weight of polydimethylsiloxane and 5 parts by weight of silicone oil and the mixture well stirred to insure a homogenous mixture. Next, 0.25 parts by weight of stannous octoate catalysts are added to the first mixture, and the second mixture and poured into an oblong mold. This is then cured for 30 minutes under ambient conditions. Then, a microporous cellulose acetate coating having pores with a diameter that permits the passage of steroids, is bonded around the exterior surface of the carrier. The carrier is about 100 .mu.m thick, has a tortuosity of 3, a porosity of 0.175, a D of 2 .times.10.sup..sup.-6 cm.sup.2 sec.sup..sup.-1 to give a release rate of 0.5 .mu.g/cm.sup.2 hr.

Detailed Description Text (69):
A drug delivery implant shaped like a rounded disc is manufactured by mixing polydimethylsiloxane with 2500 micrograms of phenylglycodol. After mixing the ingredients with stannous octoate catalysts, the mixture is cured in a disc-shaped mold at 40.degree. C. Then microporous polyhexamethylene adipamide is applied to the surface of the cured solid drug charged carrier. The microporous wall has a porosity of 60%, a pore diameter of 40 angstoms of continuous pores having a length unit greater than the length unit of the applied coat, with a tortuosity greater than 1. Next, the device is placed in a pressure vessel containing an emulsion of gum arabic and pressure applied to fill the diffusional path with a diffusive medium permeable to the passage of drug. When implanted, the implant releases to a mammalian host an effective amount of drug at a controlled rate for a prolonged time.

Detailed Description Text (77):
The procedure of Example 1 is repeated in this example. In this example, an intrauterine device 10 is seen in FIG. 7 consisting of a transverse member 30 fixed to a longitudinal dependent member 31. Device 10 is formed of a microporous wall 11 having a plurality of micropores 15 surrounding a solid reservoir, not shown, containing a member selected from the group consisting of progestational and estrogenic antifertility steroids. Member 30 interconnects with dependent member 31 and lead end 32 with member 30 extended outwards in two directions to form a pair of arms 30a and 30b with each arm terminated in rounded ends 30c. Micropores 15 optionally can be charged with a diffusive liquid medium prior to uterine placement or micropores 15 can be charged in situ with uterine biological fluid. Devices prepared according to the instant example and by using techniques set forth in previous examples represent one more embodiment of intrauterine devices made available by the invention. In one embodiment, the device comprises a microporous wall having its pores charged with a drug release rate controlling liquid media with the wall surrounding an inner mass transfer conductor. The conductor contains dissolved and undissolved diffusible antifertility agent selected from the group of steroids consisting of progestational, estrogenic steroids and mixtures thereof. The conductor in this embodiment contains from about 0.5 milligram to about 3,000 milligrams of steroid for releasing about 0.5 micrograms to 400 micrograms per day over a prolonged period of time. Steroid released by the device interfers with the reproductive process and prevents pregnancy by inducing physiological changes including decidua formation so the egg cannot implant, changes in the size of the glands often accompanied with atrophy, stroma and edematous uterine differences, and the like.

CLAIMS:

3. The drug delivery device for the continuous administration of a drug at a

controlled rate according to claim 1 wherein the release rate controlling medium housed in the micropores is a member selected from the group consisting of water, silicon oil, caster oil, olive oil, mixed oils, emulsions of castor oil in non-aqueous solutions of pigskin gelatin, condensation products of castor oil and ethylene oxide combining about 30 to 35 moles of ethylene oxide per mole of castor oil, polymeric sodium alginate and emulsified gum tragacanth.

15. A vaginal delivery device for continuously administering a vaginally acceptable drug at a controlled rate, wherein the device is comprised of (a) a wall defining the device dimensioned for insertion and retention within the vaginal cavity, with the wall formed of a vaginally acceptable material selected from the group consisting of isotroic and anisotropic microporous polymeric materials having pores for the movement of drug therethrough, (b) a reservoir formed by the inner surface of the wall and surrounded thereby, said reservoir comprised of a solid carrier permeable to the passage of diffusible drug and containing a drug selected from the group consisting of estrogenic and progestational steroids in an amount sufficient to administer drug from the carrier over a prolonged period of time to, (c) a liquid release rate controlling medium permeable to the passage of drug in said pores, and (d) wherein the device releases drug when in the environment of use by passage from the reservoir and through the medium with release by the medium rate controlling step for releasing drug to the environment to produce a local or systemic beneficial result over a prolonged period of time.

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L2: Entry 6 of 6 File: USPT Jul 13, 1999

DOCUMENT-IDENTIFIER: US 5922299 A
**** See image for Certificate of Correction ****
TITLE: Mesoporous-silica films, fibers, and powders by evaporation

Brief Summary Text (4):
Porous silica powders, with ordered porosity in the nanometer scale, have utility for catalysis, gas separation and high surface area supports for self-assembled monolayer films. Mesoporous micro-bubbles in particular, have applications in separations, thermal barriers and micro-encapsulation for drug delivery.

Brief Summary Text (28):
The volume within the interior of the mesoporous micro-bubble is undesirable for some applications including catalytic processes in which coking occurs. In these cases, the micro-bubbles may be broken by crushing or grinding. Mesoporous silica powders impregnated with catalytically active metals have applications in catalysis. The pore size, .about.25-40 .ANG., allows access of large molecules to catalysis sites. The high surface area of the powders allows high catalytic activity. The surface area of mesoporous powders was determined to be .about.900 m.sup.2 /g by nitrogen absorption. The powders may be pressed or mixed with binders and extruded to produce pellets, tubes and other shapes for structured catalyst supports. Thus, the particle size in spray-drying may be controlled for a particular application. Because the micro-bubble walls are permeable, many applications such as micro-encapsulation is possible. Silica is ingestible. Containing a drug within the micro-bubble to allows passage through the stomach where it would normally degrade. The drug is released through the porous walls into the intestinal tract. Materials, including surfactants and polymers, adsorbed to either the outside of the bubble or within the pores can acts as pH-sensitive gates for the release of the drug.

Brief Summary Text (29):
Encapsulation may be done wherein a non-drug substance may be permanently caged within the bubble by closing off the pores with silane treatment, silica precipitation, or surfactant absorption.

Detailed Description Text (58):
The calcined mesoporous aluminosilicate film with a TEOS/Al mole ratio of 0.25 was characterized by SEM. The calcined mesoporous aluminosilicate film was homogeneous; no crystal gains were observed. A small amount of surface roughness was observed which had the same appearance of the AFM image discussed in Example 1. EDS characterization of the calcined mesoporous aluminosilicate film showed the presents of aluminum. The EDS characterization was not quantitative because of significant penetration of the electron beam through the calcined mesoporous aluminosilicate film and into the silicon wafer substrate.